

BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 4

NOVEMBER 1957

PART 3

INSTITUTE NEWS

Election of Members

The following 14 Ordinary Members and 1 Student Member were elected on 19 September 1957:

As Ordinary Members

- ASHTON-MARTIN, Clinton Desmond, B.E., B.A., Director, Martin Furnace and Engineering Pty., Ltd., 168-174 Euston Road, Alexandria, Sydney, N.S.W., Australia.
- BURTON (Mrs.) Lucie R., Director, Despo Manufacturing Co., Ltd., 30 Pancras Road, London, N.W.1.
- FORBES, James Macleod, Scottish Area Sales Manager, Henry Wiggin and Co., Ltd., 5 Park Circus Place, Glasgow, C.3.
- FORD, Anthony Reginald, Managing Director, Vowles Aluminium Foundry Co., Ltd., Bank Street, West Bromwich, Staffs.
- FORTESCUE, Richard Lewis, M.A., A.M.I.E.E., Director, Capper Pass and Son, Ltd., Melton Works, North Ferriby, East Yorks.
- KRAMER, Pieter Johannes, Ing., Lecturer in Mechanical Engineering, including Metallurgy, Howard College, University of Natal, King George V Avenue, Durban, South Africa.
- MANENC, Jack André, Doct. ès Sc. Phys., Ingénieur de Recherches, Office National d'Etudes et de Recherches Aéronautiques (O.N.E.R.A.), 25 Avenue de la Division-Leclerc, Chatillon-sous-Bagneux (Seine), France.
- NELSON, Richard Garner, B.S., Research Associate, Universal-Cyclops Steel Corp., Bridgeville, Pa., U.S.A.
- NOTINI, Ulf G., Bergsing., Director of Research, Jernkontoret, Kungsträdgårdsgatan 6, Stockholm C., Sweden.
- SHANKS, William Alexander, Metallurgist, Honeywell-Brown, Ltd., Newhouse, Motherwell, Lanarkshire.
- SMITH, Alastair Ian, B.Sc., A.I.M., Principal Scientific Officer, Mechanical Engineering Research Laboratory, Mechanics and Materials Division, East Kilbride, Glasgow.
- SMITH, Eugene Monroe, M.S., Research Division, Lukens Steel Co., Coatesville, Pa., U.S.A.
- THORNTON, James Menzies, Technical Representative, Morgan Crucible Co., Ltd., 150 Hope Street, Glasgow.
- YOSHIOKA, Professor Shozo, D.Eng., Professor of Metallography, College of Engineering, University of Osaka Prefecture, Mozu-higashinocho, Sakai, Osaka Prefecture, Japan.

As Student Member

- PRIESTNER, Ronald, B.Sc., Research Student, Department of Physical Metallurgy, University of Birmingham.

"Metallurgical Reviews"

The latest issue of *Metallurgical Reviews* (Vol. 2, No. 7) contains two contributions: "The Brittle Fracture of Metals

at Atmospheric and Sub-zero Temperatures", by Dr. C. F. Tipper and "Extrusion Presses and Press Installations", by E. K. L. Haffner and R. M. L. Elkan.

Metallurgical Reviews is available only by annual subscription of £2 2s. 6d. (\$6.50), post free; to members of the Institute £1 12s. 6d. (\$5.00), post free.

PERSONAL NOTES

DR. J. B. AUSTIN has been promoted to be Vice-President, Research and Technology, United States Steel Corp., Pittsburgh, Pa.

MR. J. D. BAIRD has been awarded the Ph.D. degree of Glasgow University. He is now at the Research Laboratory, Associated Electrical Industries, Aldermaston, Berks.

MR. J. W. BARTON has left the University of Liverpool, where he obtained the M.Eng. degree, and is now a Research Associate in the Department of Mining and Metallurgy, Alberta University, Edmonton, Alberta.

PROFESSOR DR. W. G. BURGERS, Corresponding Member to the Council for the Netherlands, who has been seriously ill since November 1956, is now making a good recovery after an operation for the amputation of his right leg. He has been able to resume part of his work at the Technische Hogeschool at Delft.

DR. L. A. CARAPPELLA has left the Continental Can Co., Inc., and is now Technical Director, Jessop Steel Co., Washington, Pa.

MR. R. CHADWICK has been elected President of the Birmingham Metallurgical Society for the year 1957-58, not Chairman as erroneously stated in the August issue of the *Bulletin*.

PROFESSOR G. CHAUDRON received the Osmond Medal at the recent Autumn Meeting of the Société Française de Métallurgie.

MR. MORGAN H. DAVIES has left the Fulmer Research Institute to take up an appointment as Senior Technical Officer with the Zinc Development Association.

MR. D. J. DOSSETT has been appointed Chief Metallurgist of Omcs, Ltd., Barnes, London.

MR. P. GAUNT has been appointed Assistant Lecturer in Physics at the University of Sheffield.

DR. J. V. HARDING has left International Meehanite Metal Co., Ltd., to join British Oxygen Research and Development, Ltd., London, S.W.19.

MR. E. L. HARMON, Jr., has left the Case Institute of Technology and is now on the staff of the Metals Research Laboratories, Electro Metallurgical Co., Niagara Falls, N.Y.

MR. D. B. HERBERT has left Canadian Rockwell, Ltd., to become Metallurgical Engineer to the Norton Co., Chippawa, Ont.

DR. J. H. HOLLOMON, Manager of the Metallurgy and Ceramics Research Department, General Electric Co., has been appointed Chairman of one of three new committees set up by the U.S. National Academy of Sciences. The committee forms part of a comprehensive investigation being made by the Academy into the relation of scientific trends to the programme of the U.S. Air Force Air Research and Development Command.

MR. M. C. HUFFSTUTLER has left the Dow Chemical Company on his appointment as Assistant Professor in the Department of Mining and Metallurgy at Texas Western College, El Paso, Texas.

ING. GÜNTHER JOSEPH has graduated Dr.rer.nat. from the Technische Hochschule, Stuttgart, and has returned to Santiago de Chile.

MR. R. L. H. LANCASTER has been appointed Chairman of Goodlass Wall and Lead Industries, Ltd.

MR. F. L. LAQUE has been elected Vice-President of the American Society for Testing Materials for the year 1957-58.

MR. K. LONG has been appointed Casting Superintendent, Canadian British Aluminium Co., Ltd., Baie Comeau, P.Q.

DR. J. W. MARTIN has been appointed Lecturer in Metallurgy at Oxford University.

DR. O. T. MARZKE has been appointed Vice-President (Fundamental Research), U.S. Steel Corp., Pittsburgh, Pa.

MR. H. J. MISTRY has left the Manchester College of Technology, where he obtained the M.Sc. Tech. degree, and is now a Technical Officer on the staff of the Research Department, Imperial Chemical Industries, Ltd., Metals Division, Birmingham.

MR. D. NORTH has left Birmingham University and joined the Atomic Power Department, English Electric Co., Ltd., Whetstone, near Leicester.

DR. W. S. OWEN has been appointed to the Henry Bell Wortley Chair of Metallurgy at Liverpool University.

MR. D. P. PATELL has left The Associated Cement Companies, Ltd., to become Maintenance Engineer, Burn and Co., Ltd., P.O. Raniganj, Dist. Burdwan, W. Bengal.

MR. A. M. PATTON has left Cambridge University and has taken up an appointment in the Development and Research Department of The Mond Nickel Co., Ltd., Birmingham.

DR. V. A. PHILLIPS has resigned his lectureship at Sheffield University and taken up an appointment as a Research Associate with the Metallurgy and Ceramics Research Department of the General Electric Co., Schenectady, N.Y.

MR. N. P. PINTO has left Sylvania Electric Products, Inc., Hicksville, L.I., and joined The Beryllium Corp., Reading, Pa.

DR. J. R. RAIT has been appointed Joint Managing Director of the Briton Ferry Steel Co., Ltd., South Wales. Since 1947 he has been Research Controller and Local Director of Hadfields, Ltd., Sheffield.

MR. A. F. ROWCLIFFE has left University College, Swansea, having graduated with a Second Class Honours degree in Metallurgy, and has been appointed a Scientific Officer with U.K. Atomic Energy Authority (Industrial Group), Culcheth, near Warrington.

MR. J. A. SABATO, Director of Investigaciones Metalúrgicas, Buenos Aires, will be engaged on research in the Department of Physical Metallurgy, University of Birmingham, until September 1958.

DR. N. L. SAMWAYS has joined the Research and Development Section of the Jones and Laughlin Steel Corp., Pittsburgh, Pa.

DR. CYRIL STANLEY SMITH has resigned his position as Director of the Institute for the Study of Metals at the University of Chicago, in order to devote more time to research.

MR. J. STEPHENSON has been appointed Senior British Representative of the U.K. Atomic Energy Authority to Atomic Energy of Canada, Ltd., Chalk River, Ont.

MR. D. F. STONEBURNER is on leave of absence from the Oak Ridge National Laboratory while undertaking full-time graduate work at the Carnegie Institute of Technology, Pittsburgh, as a Union Carbide Corp. Fellow.

DR. G. SUMNER has left Manchester University and is now on the staff of U.K. Atomic Energy Authority (Industrial Group), Springfield, near Preston, Lancs.

MR. G. V. E. THOMPSON, of the Information Department of the British Non-Ferrous Metals Research Association, has been awarded the London University degree of B.Sc. (Eng.) in Chemical Engineering with Second Class Honours.

DR. H. E. TUCHSCHMID has left Aluminium Industrie A.G., Neuhausen, and is now on the staff of the Battelle Memorial Institute, Garouge-Genève.

MR. P. VASUDEVAN has left Manchester University, having obtained the Ph.D. degree, and has returned to India. His address is The Norman Printing Bureau, P.O. Kozhikode, Kerala State, India.

MR. R. G. WALMSLEY has been appointed Director and General Manager of Railko, Ltd., Loudwater, High Wycombe, Bucks.

MR. C. M. WAYMAN has been appointed Assistant Professor of Metallurgical Engineering in the University of Illinois, Urbana, Ill.

Death

The Editor regrets to announce the death of:

MR. COLIN GREYSTY, a Director of the North Eastern Marine Engineering Co., Ltd., Wallsend-on-Tyne, on 9 September 1957.

OBITUARY

Dr. Irving Langmuir

Dr. Irving Langmuir, an Honorary Member of the Institute, died on 16 August 1957 at Falmouth, Mass., while on vacation in New England.

Irving Langmuir was born in Brooklyn, N.Y., on 31 January 1881. After obtaining his elementary education at public schools in Brooklyn, he travelled with his parents to Paris, where he studied for three years. He then returned to the United States, studied for a year at Chestnut Hill Academy, Philadelphia, then in Brooklyn at Pratt Institute, and at the School of Mines, Columbia University. In 1903 he graduated from Colombia with a degree in metallurgical engineering. Again he visited Europe, this time to study at the University of Göttingen in Germany, where he was awarded the Ph.D. degree in 1906.

Until July 1909 he taught chemistry at Stevens Institute of Technology, Hoboken, N.J. He then joined the staff of the General Electric Company's Research Laboratory at Schenectady, N.Y., to begin a long and distinguished career in many fields of science.

His contributions to pure scientific knowledge, though little known to the layman, are considered of the highest importance, his studies on electron emission and on gaseous discharges in particular being regarded as classics. His experiments with oil films on water uncovered an entirely new branch of chemistry, known as two-dimensional or surface chemistry, in which phenomena were found to be entirely different from any previously known. Experimental techniques that he developed for studying proteins furnished a new and powerful method of attack on fundamental problems connected with the functions of the human organism, and are now being used by biochemists and biophysicists throughout the world.

For his accomplishments, Dr. Langmuir received the world's highest scientific awards, including the Nobel Prize in chemistry in 1932. Both a chemist and a physicist, he was once described as one "who continually embarks upon mental voyages in regions so nearly airless that only the mind can breathe in comfort". It was on such "voyages" that he developed the gas-filled incandescent lamp, the high-vacuum power valve, atomic hydrogen welding, a highly-efficient screening-smoke generator for military purposes, and methods for the artificial production of snow and rain from the clouds.

The gas-filled lamp, which after its original development was further improved by Dr. Langmuir and others, increased many times the efficiency of electric lamps. In terms of modern illumination levels, the development of the gas-filled lamp and its subsequent improvements save the American people nearly three million dollars every night or almost one billion dollars per year in electric light bills.

The high-vacuum power valve, which permitted the use of high voltages in radio transmission and reception for the first time, gave modern broadcasting its "heart" and is regarded as probably the greatest single development in that field.

Atomic hydrogen welding made possible the easy welding of aluminium and chromium and other hitherto unweldable metals and permitted the joining of extremely thin sheets of metal, which would be burned by other processes.

Together with Dr. Vincent J. Schaefer, Dr. Langmuir developed a new technique for producing huge quantities of extremely dense screening smoke which proved highly effective in concealing tactical movements of troops and supplies in combat in the Second World War. Smoke generators employing this technique were referred to by the Chemical Warfare Service as "one of the major triumphs of science in helping the nation's war".

In recent years, Dr. Langmuir's work—conducted with Dr. Schaefer and Dr. Bernard Vonnegut while the Research Laboratory had a joint programme of weather research with the Army Signal Corps and the Office of Naval Research—resulted in the discovery of methods by which precipitation can be induced from certain types of clouds. This work may prove to be of greater significance to mankind than any of his other accomplishments, although proper evaluation may not be possible for many years yet.

The three scientists developed methods of producing snow and rain from supercooled or below-freezing liquid clouds by seeding them either with dry ice or with silver iodide. By these methods, ice crystals are produced which grow at the

expense of the liquid droplets and may fall as snow, may change to rain, or may evaporate, depending upon atmospheric conditions. Dr. Langmuir developed a third method for producing rain directly from certain cumulus clouds of any temperature; by this method ordinary water dispensed into such clouds may cause a chain-reaction rainfall.

Among other major scientific accomplishments of Dr. Langmuir's were the condensation mercury-vapour pump for producing a very high vacuum, and a series of highly effective submarine detectors used in the First World War, which he developed in collaboration with Dr. William D. Coolidge, retired Vice-President and Director of Research for the General Electric Company.

As an outgrowth of his study of oil films on water, Dr. Langmuir devised a means for optically detecting viruses, toxins, poisons, and other tiny and invisible materials, which has proved highly useful in biology and toxicology.

Despite the scope and significance of his accomplishments, Dr. Langmuir attributed all his success solely to scientific curiosity and an ability to profit from the unexpected. Of his work, he said: "Whatever has come in industrial applications has come incidentally from experiments followed for their interest alone."

Dr. Langmuir retired from his position as Associate Director of the General Electric Laboratories in 1950, though continuing to serve as consultant until his death.

Among scientific honours he received were the Nichols Medal, twice awarded by the New York Section of the American Chemical Society, once in 1915 for his work on chemical reactions at low pressures, and again in 1920 for his work on the atomic structure. The Hughes Medal of the Royal Society of London was awarded to him in 1918 for his researches in molecular physics, while in 1920, the American Academy of Arts and Sciences gave him the Rumford Medal for his thermionic researches and for his development of the gas-filled incandescent lamp. In 1925, the Reale Accademia Nazionale dei Lincei, Rome, bestowed upon him the Cannizzaro Prize. In 1928 he was the recipient of the Perkin Medal, and in 1930 he was awarded the Chandler Medal and the Willard Gibbs Medal.

In 1932, Dr. Langmuir became the first American industrial chemist to receive the Nobel Prize for chemistry, awarded to him for researches in his new-found field of surface chemistry. In the same year, *Popular Science Monthly* magazine awarded him its annual medal and honorarium of \$10,000 as "an American who has done notable scientific work". The Franklin Medal of the Franklin Institute and the Holley Medal of the American Society of Mechanical Engineers were given him in 1934, and the city of Philadelphia presented him with the Johns Scott Award in 1937. In 1940, he received a plaque as a "Modern Pioneer of Industry" from the National Association of Manufacturers, and in 1943 he was made an Honorary Member of the Institute of Metals. In 1944, Dr. Langmuir became the fourth American to receive the coveted Faraday Medal of the Institution of Electrical Engineers. The Mascart Medal of the Société Française des Electriciens was presented to him in 1950.

Dr. Langmuir was a foreign member of the Royal Society of London and a Fellow of the American Physical Society. He had served as President of the American Chemical Society, and as President of the American Association for the Advancement of Science (1941). Other organizations of which he was a member included the Academy of Arts and Sciences, Uppsala; Tau Beta Pi; Phi Lambda Upsilon; and Sigma Xi.

An honorary member of several societies, including the

Chemical Society (London) and the Royal Institute of Chemistry, Dr. Langmuir held honorary degrees from the following colleges and universities: Northwestern, Union, Edinburgh, Columbia, Kenyon, Princeton, Lehigh, Harvard, Oxford, Johns Hopkins, Rutgers, Queens (Canada), and Stevens Institute of Technology.

Keenly interested in young people, Dr. Langmuir in his earlier years was associated with the Boy Scout movement and organized and served as a scoutmaster of one of the first troops in Schenectady. He was also an enthusiastic skier and mountain climber, and for many years he owned and flew an aeroplane.

In a recent tribute, his former colleague Dr. W. D. Coolidge said:

"Dr. Irving Langmuir was one of the world's great scientists. He contributed greatly through the scientific help that he gave directly to others, who, knowing of his honesty and generosity, consulted him.

"Always able to interest himself actively in the problems of others, he was able, with his keenly analytical mind, to come directly to the key points.

"By nature, he was very modest. By chance, I was the first person to whom he spoke after he received word by telephone of the award to him of the Nobel Prize. I can still see his look of both pleasure and modest incredulity.

"He has, in many ways, left a deep and permanent impression on science, and the story of his life-long dedication to the study of nature and the integrity, generosity, enthusiasm and industry which he devoted to it will always be an inspiration."

OTHER NEWS

Conference on Band Theory of Metals

A two-day Conference on "The Band Theory of Metals and Experimental Investigations into the Structure of the Fermi Surface" is being held by the Physical Society at Imperial College, London, S.W.7, on 19 and 20 December. Further information may be obtained from the Secretary of the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7.

Observations of Dislocations in Metals

A course of lectures on "Observations of Dislocations in Metals and Inorganic Crystals" will be given in the H. H. Wills Physical Laboratory, University of Bristol, on 24-29 March 1958. The lecturers will include Professor F. C. Frank, Dr. J. W. Mitchell, Dr. J. F. Nye, and Dr. N. Thompson. Further information can be obtained from the Director, Department of Adult Education, University of Bristol.

The Aluminium Development Association

A number of changes in the membership of the Council and of the Executive Committee of the Association have been announced.

On the Council, Mr. S. E. CLOTWORTHY, Managing Director of Northern Aluminium Co., Ltd., has succeeded Mr. W. FRASER BRUCE as the representative of that Company. Mr. B. L. PAGE (a Director of John Dale, Ltd.) has succeeded Mr. J. F. PAIGE as the representative of the aluminium founders' organization, L.M.F.A. Development, Ltd.

The Council appointed to the Executive Committee Mr. R. T. RAVEN (Works Director of Birmetals, Ltd.) as the representative of Birmid Industries, Ltd., in place of Mr. HAROLD GOODWIN, who has retired; and Mr. DESMOND JAMES (T.I. Aluminium, Ltd.) in place of Mr. W. H. BOWMAN.

DIARY

The Institute

14 November. "The Low-Temperature Deformation of Metals", by Dr. T. H. Blewitt. (17 Belgrave Square, London, S.W.1, at 6.30 p.m.)

5 December. "Design and Operation of Waste-Heat Boilers in the Chemical Industry", by Captain W. Gregson. (Joint Meeting with the Chemical Engineering Group of the Society of Chemical Industry.) (Chemical Department, The University, Woodland Road, Bristol, at 6.30 p.m.)

9-10 December. Symposium on "Vacancies and Other Point Defects in Metals and Alloys". Attendance by registration only. (Cockcroft Hall, Atomic Energy Research Establishment, Harwell, Berks.)

Powder Metallurgy Joint Group

4 December. Inaugural Meeting. (Church House, Great Smith Street, London, S.W.1, at 10.30 a.m. and 2.15 p.m.)

Local Sections and Associated Societies

14 November. Liverpool Metallurgical Society. "Corrosion and Microstructure", by Dr. C. Edleanu. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)

14 November. North East Metallurgical Society. "Fatigue", by Dr. N. Thompson. (Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 7.15 p.m.)

20 November. Manchester Metallurgical Society. "Metallurgical Education", by Professor G. V. Raynor. (Manchester Room, The Central Library, Manchester, at 6.30 p.m.)

21 November. Birmingham Local Section. "Metallurgical Thermodynamics", by Dr. J. N. Pratt. (College of Technology, Gosta Green, Birmingham, at 6.30 p.m.)

27 November. North East Metallurgical Society. Visit by the President of the Institution of Metallurgists. (Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 7.15 p.m.)

2 December. East Midlands Metallurgical Society. "Recent Developments in Plain Bearings", by M. J. Neale (College of Art, Green Lane, Derby, at 7.30 p.m.)

4 December. Manchester Metallurgical Society. "The Metallurgical Applications of High-Resolution Electron Microscopy", by Dr. J. Nutting (Manchester Room, The Central Library, Manchester, at 6.30 p.m.)

5 December. Birmingham Local Section. Students' Evening. (College of Technology, Gosta Green, Birmingham, at 6.30 p.m.)

5 December. Leeds Metallurgical Society. "Some Uncommon Failures of Engineering Plant in Service", by G. A. Cottell. (Lecture Room C, Chemistry Wing, The University, Leeds 2, at 7.15 p.m.)

APPOINTMENTS VACANT

- 9 December. **Scottish Local Section.** "Recent Developments in Magnesium-Base Alloys", by Dr. E. F. Emley. (Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, Glasgow, C.2, at 6.30 p.m.)
- 10 December. **South Wales Local Section.** "Hardness of Metals", by Dr. D. Tabor. (Department of Metallurgy, University College, Singleton Park, Swansea, at 6.30 p.m.)
- 11 December. **London Local Section.** "Properties of Castings", by F. Hudson. (Joint Meeting with the London Branch of the Institute of British Foundrymen.) (Constitutional Club, Northumberland Avenue, London, W.C.2, at 7.30 p.m.)
- 11 December. **North East Metallurgical Society.** "Stress-Corrosion Cracking", by Dr. T. P. Hoar. (Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 7.15 p.m.)
- 12 December. **Liverpool Metallurgical Society.** "Titanium", by Dr. J. W. Rodgers. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.30 p.m.)

British Nuclear Energy Conference

- 5 December. "Advanced Types of Power Reactor", by Dr. J. V. Dunworth (Institution of Electrical Engineers, Savoy Place, W.C. 2, at 5.30 p.m.)

APPOINTMENTS VACANT

GRADUATE CHEMIST required for senior position involving physical chemical research on problems connected with application of aluminium, especially surface reactions, metal finishing, lubrication, and lacquer adhesion. Previous experience in this field not essential. A Pension and Life Assurance Scheme in operation. Apply to: Personnel Officer, Aluminium Laboratories Limited, Banbury, Oxon.

HIGH DUTY ALLOYS, LTD., Castings Division, Slough, Bucks, require a Metallurgist with a degree or equivalent qualification. Candidates should preferably have some experience in production of light-alloy sand and die castings. This is a senior appointment, and the starting salary will be on a generous scale commensurate with qualifications and experience. Contributory Pension Scheme in operation. Write giving full details of qualifications and experience, which will be treated in strict confidence, to the Company Personnel Manager.

METALLURGISTS

THE GLACIER METAL COMPANY, LTD., has two vacancies in its **RESEARCH & DEVELOPMENT ORGANIZATION**:

1. For one of these the person appointed will be in charge of a section of five members with responsibility for fundamental research into bearing materials. The job involves planning field and laboratory experiments and interpreting results. Facilities provided include laboratory rigs manned and maintained by trained engineers. Ample ancillary services also available. Company vehicles are used for the field testing of bearings, and the results of such tests, together with service experience in customers'

engines, provide a rich source of data. Besides this fundamental work, *ad hoc* problems arise from time to time which bring the Metallurgist into contact with Company Production Managers and Engineers and also with fellow Metallurgists in customer firms.

Candidates should preferably have an honours degree in Metallurgy and be familiar with standard metallographic techniques. The appointment will be made at a **STARTING SALARY** within the range either £800-£1200 p.a. or £1200-£1600 p.a., according to experience and qualifications. The post offers satisfying work and good career opportunities for a man wanting to do fundamental research who likes the experience of seeing his results put into practice.

2. In the other post, the occupant will be required to take part in a development programme which has been planned for the production of a new bearing material. His duties will be to investigate specific problems concerning the metallurgical aspects of the manufacturing process. A degree or equivalent in either Metallurgy or Physics is required, together with at least two years post-graduate experience of metallurgical work. A **STARTING SALARY** of £900-£1100 p.a. will be paid.

Applications for either of these positions should be sent to the Personnel Director (Ref. MET), Glacier Metal Co., Ltd., Ealing Road, Alperton, Wembley, Middx.

METALLURGISTS required for control and development work on the production of non-ferrous metals. A degree or equivalent qualification is necessary with industrial experience. The posts have ample scope for advancement for people with initiative. Adequate salary based on qualifications and experience; contributory pension scheme; assistance with living accommodation after short period of service. Apply in confidence to Labour Manager, Enfield Rolling Mills, Ltd., Brimsdown, Enfield, Middx.

MINISTRY OF SUPPLY require Chemist (Metallurgist) at Harefield, Middlesex, to take charge of high-temperature materials laboratory, with responsibility for high-sensitivity creep tests, metallography of titanium and heat-resisting alloys, heat-treatment and pyrometry. Quals.: British, or British parents. Hons. degree in metallurgy or associateship of the Institution of Metallurgists, or equivalent. Considerable experience in metallography and heat-treatment essential. Experience in mechanical testing and creep testing an advantage. Salary: £775 (at age 25)-£1180 p.a. Forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting F223/7A. Closing date 18 November 1957.

OLD - ESTABLISHED NON - FERROUS METALS Manufacturers in S.W. Lancashire require a qualified **METALLURGIST** for Process Control.

This vacancy is particularly suitable for a young man who has completed, or is about to complete his National Service.

Applicants should write stating details of education and qualifications. Box No. 426, The Institute of Metals, 17 Belgrave Square, London, S.W.1.

PROFESSORIAL CHAIR—Metallurgy or Physics of Metals—No administrative assignments—Eastern United States. Starting salary \$15,000 per year. September 1958 appointment. Recommendations as well as applications solicited. Box No. 430, The Institute of Metals, 17 Belgrave Square, London, S.W.1.

UNIVERSITY OF BIRMINGHAM

DEPARTMENT OF INDUSTRIAL METALLURGY

Applications are invited for a research post in the Department of Industrial Metallurgy for work on the frictional and surface properties of titanium and its alloys during metal-working processes. The appointment will be either at a junior level, with a salary of up to £400 p.a., or at a senior level, with a salary up to £800 p.a. Research or industrial experience is required in the case of the senior appointment.

Applications (two copies) should be sent to the Deputy Registrar, The University, Edgbaston, Birmingham 15, as soon as possible.

Just Published

*A book that should be on the shelves of every
Foundryman*

THE SOLIDIFICATION OF CASTINGS

Second, revised and enlarged edition

By R. W. RUDDLE, M.A., F.I.M.

Technical Manager, Foundry Services, Inc., Columbus, Ohio

(Institute of Metals Monograph and Report Series, No. 7)

Demy 8vo. Cloth bound. 406 pages, with 177 illustrations

Price: 42s. or \$6.50, post free; Libraries 35s. or \$5.40, post free;

Members (one copy each), 25s. or \$3.75, post free

THE INSTITUTE OF METALS 17 BELGRAVE SQUARE LONDON S.W.1

• THE JOURNAL OF
•
The British Nuclear Energy Conference

• Institution of Civil Engineers

• Institution of Mechanical Engineers

• Institution of Electrical Engineers

• Iron and Steel Institute

• Institute of Metals

• Institute of Physics

• Institution of Chemical Engineers

Annual Subscriptions:

MEMBERS 30/-

post free

• JANUARY • APRIL • JULY • OCTOBER

NON-MEMBERS 60/-

post free

• The Journal contains papers and discussions on the applications
• of nuclear energy and ancillary subjects.

Full particulars are available from: The Secretary, B.N.E.C., 1-7 Great George Street, London, S.W.1